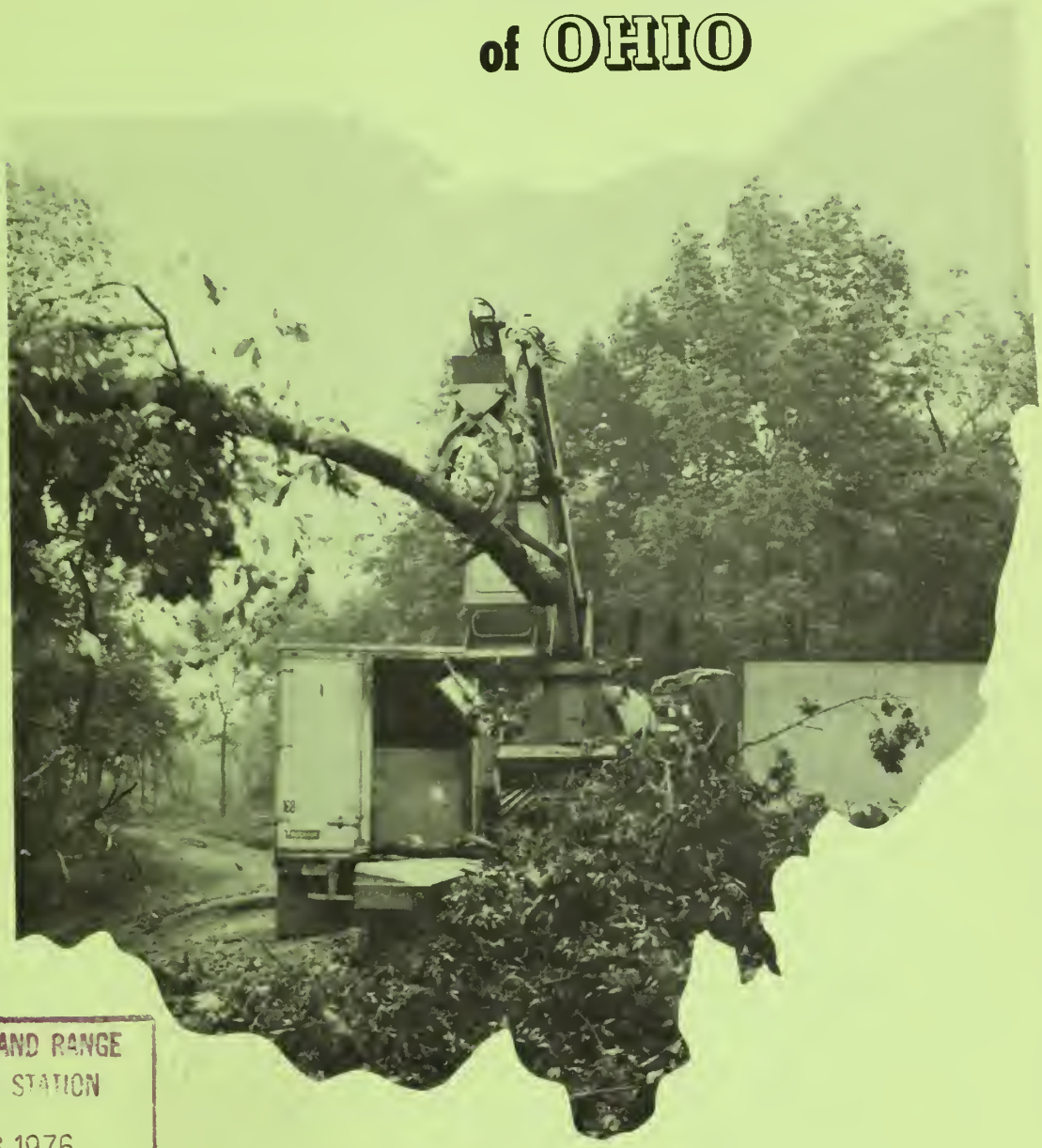
Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

by James T. Bones
and Robert B. Redett

The Timber Industries of OHIO



SW FOREST AND RANGE
EXPERIMENT STATION
FEB 26 1976
ATION LIBRARY COPY

USDA FOREST SERVICE RESOURCE BULLETIN NE-40
1976

FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE
NORTHEASTERN FOREST EXPERIMENT STATION
6816 MARKET STREET, UPPER DARBY, PA. 19082
F. BRYAN CLARK, STATION DIRECTOR

Cover Photo

Whole-tree harvesting is an advance in timber-harvesting technology in Ohio. This is ideally suited for converting hardwood stands to even-aged management and for increasing wood recovery from land-clearing projects. There is some question, though, whether some valuable timber being chipped up for pulpwood could be put to more profitable uses.

THE AUTHORS

JAMES T. BONES, Research Forester, received his bachelor's degree in soil conservation from Utah State University in 1952 and his master's degree in forest management from the same university in 1956. He worked at the Pacific Northwest Station and the Institute of Northern Forestry until 1965, when he became a United Nations forestry advisor to the Government of Colombia in South America. After his return in March 1968, he was transferred to the Northeastern Forest Experiment Station. He is now stationed in Upper Darby, Pa., where he is working in the timber-removals phase of the Forest Survey.

ROBERT B. REDETT, Assistant Chief of the Division of Forestry of the Ohio Department of Natural Resources, received his forestry degree from Michigan State University in 1942. After 3 years in the U.S. Navy during World War II, he joined the Ohio Division of Forestry in 1946, where he has served in the field as Acquisition Forester and District Forester. In 1953 he was assigned to the Division's headquarters in Columbus, where he has served in a series of staff positions relating to fire protection, timber management, reforestation, and utilization and marketing.

MANUSCRIPT RECEIVED FOR PUBLICATION 19 JUNE 1975

The Timber Industries of OHIO

CONTENTS

HIGHLIGHTS 1
BACKGROUND 2
THE TIMBER RESOURCES 2
TIMBER-BASED INDUSTRIES 4
  Then 4
  Now 6
  Tomorrow 6
MAJOR TIMBER INDUSTRIES 7
  Lumber and sawlogs 7
  Pulpwood 8
WOODEN-CONTAINER INDUSTRIES 9
  Cooperage 9
  Veneer 9
MINOR TIMBER INDUSTRIES 9
MANUFACTURING RESIDUES 10
REFERENCES 11
INDEX OF TABLES 12

HIGHLIGHTS

THE 1973 TIMBER-INDUSTRY survey showed that, since the 1966 survey in Ohio:

- Total roundwood output has declined 14 percent to 83.2 million cubic feet.
- Sawlog production has declined 10 percent to 351 million board feet.
- The number of sawmills in Ohio has declined from 411 to 310.
- Total pulpwood production has declined 2 percent to 369 million cords.
- Veneer- and cooperage-log production has declined 37 percent to 12.2 million board feet.
- Use of manufacturing residues has increased from 58 percent to 79 percent of the total available.

BACKGROUND

THE FOREST SERVICE of the U.S. Department of Agriculture conducts continuing forest surveys of all states to provide up-to-date information about the timber resources of the Nation.

The first forest survey of Ohio was completed in 1953 *(Hutchison 1956)*. Fifteen years later, the State was resurveyed, employing new aerial photographs, remeasuring permanently located field plots, and establishing new plots. The second timber-resource report *(Kingsley 1970)* showed the forest-area and inventory-volume statistics for 1968 and presented the timber-supply outlook and management opportunities for Ohio forests. In addition, statistics for the Hill Country of Ohio were presented in a separate report *(DeBald 1969)*. A third statewide timber survey is still several years away.

Because the timber-resource reports that result from these surveys are many years apart, information about the State's timber supply, its forest industries, and the output of industrial wood is needed for intervening years. Forest-industry surveys such as this one are made possible by assistance from the states for interim years between timber-resource surveys. Such industry surveys are essential for forestry and industrial planning purposes when important changes have taken place.

Important changes have occurred in the makeup of industry in Ohio since 1966. A 25-percent drop in the total number of sawmills and a shift in the source of pulpwood procured by Ohio pulpmills are only two indications of these changes. These and other changes in forest-industry production patterns were identified during the 1973 Ohio timber-industry survey.

This report is the result of a 100-percent canvass of primary wood manufacturers in Ohio by the Northeastern Forest Experiment Station's Forest Survey project and the Ohio Division of Forestry. Pulpwood production data were gathered during the Station's annual survey of woodpulp producers of the Northeast. No attempt was made to trace wood not channeled through primary manufacturers. Therefore, products such as veneer logs that were purchased by brokers for export would not be included in the veneer-log production totals.

The Ohio Division of Forestry assembled a list of all known wood-manufacturing firms for this canvass, and later their personnel contacted all nonrespondents. The Experiment Station mailed questionnaires to each firm (including possible out-of-state consumers of Ohio roundwood) and compiled the data from the completed questionnaires.

THE TIMBER RESOURCES

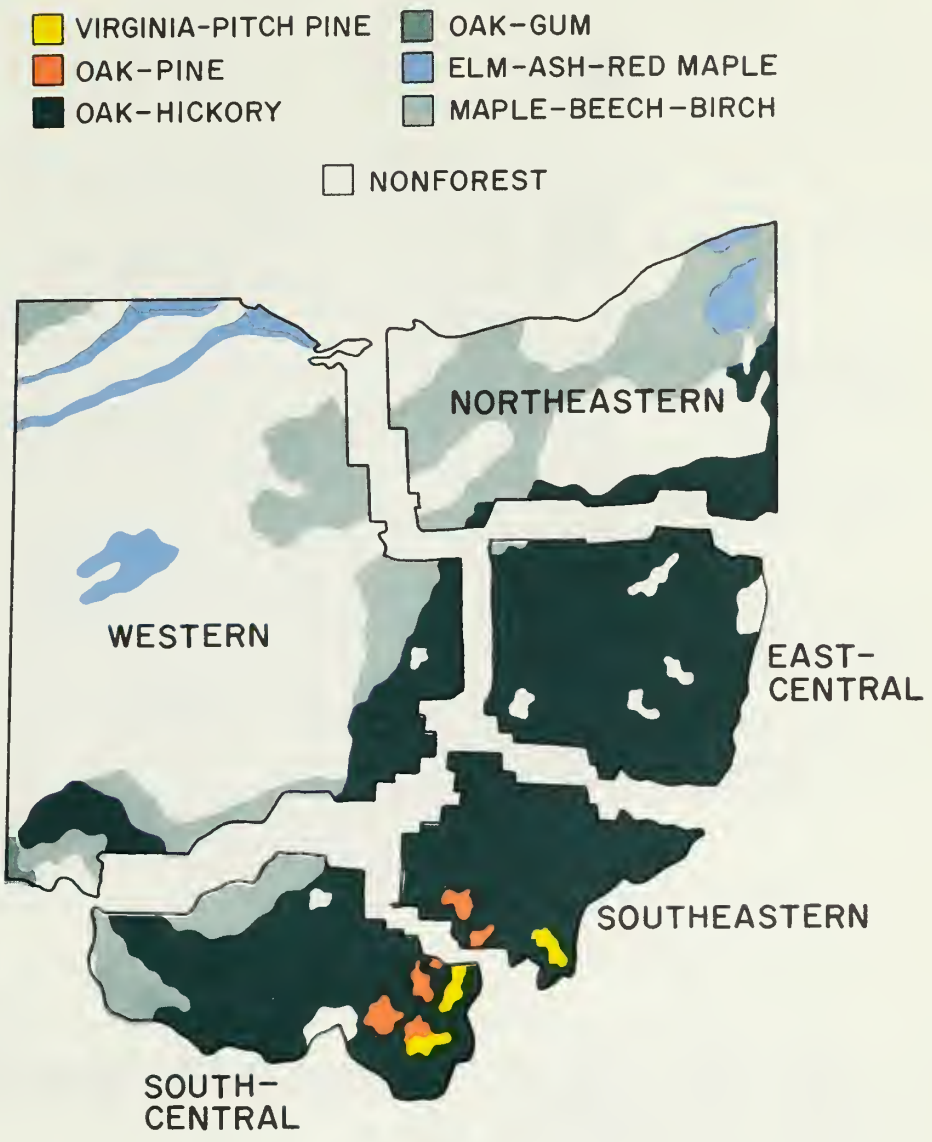
The 1968 Ohio timber-resource report showed that the State has an abundance of wood fiber in trees 5 inches dbh (diameter breast high) and larger. The annual removals rate, based on the trend between 1951 and 1967, equaled only one-half of the volume added annually by growth to growing-stock trees (less mortality). Approximately 61 million cubic feet of hardwood growing-stock volume on commercial forest land and a million cubic feet of softwood was accumulating annually in Ohio's forest bank account.

Estimates from a 1970 updating (USDA FS 1973) of statistics indicate a slight rise in the annual removals rate of growing stock, and an increase in the growing-stock volume inventory. About 45 million cubic feet of growing-stock volume was then accumulating annually in Ohio's forests.

Statewide, hardwoods make up more than 97 percent of the growing-stock volume. Oaks are by far the leading species of tree, accounting for 39 percent of the total volume. Net growth of growing stock exceeded removals in all but the Western Region (table 1). In this region the hardwood growing stock harvested during the 1951-67 base period exceeded growth for the period. In terms of sawtimber volume, the hardwood harvest exceeded growth in the Western Region also. Overall, however, these deficits were more than outweighed by sawtimber and growing-stock growth in the other regions.

Ohio's Hill Country, which contains the East-Central, Southeastern, and South-Central Regions, is where the timber resources of

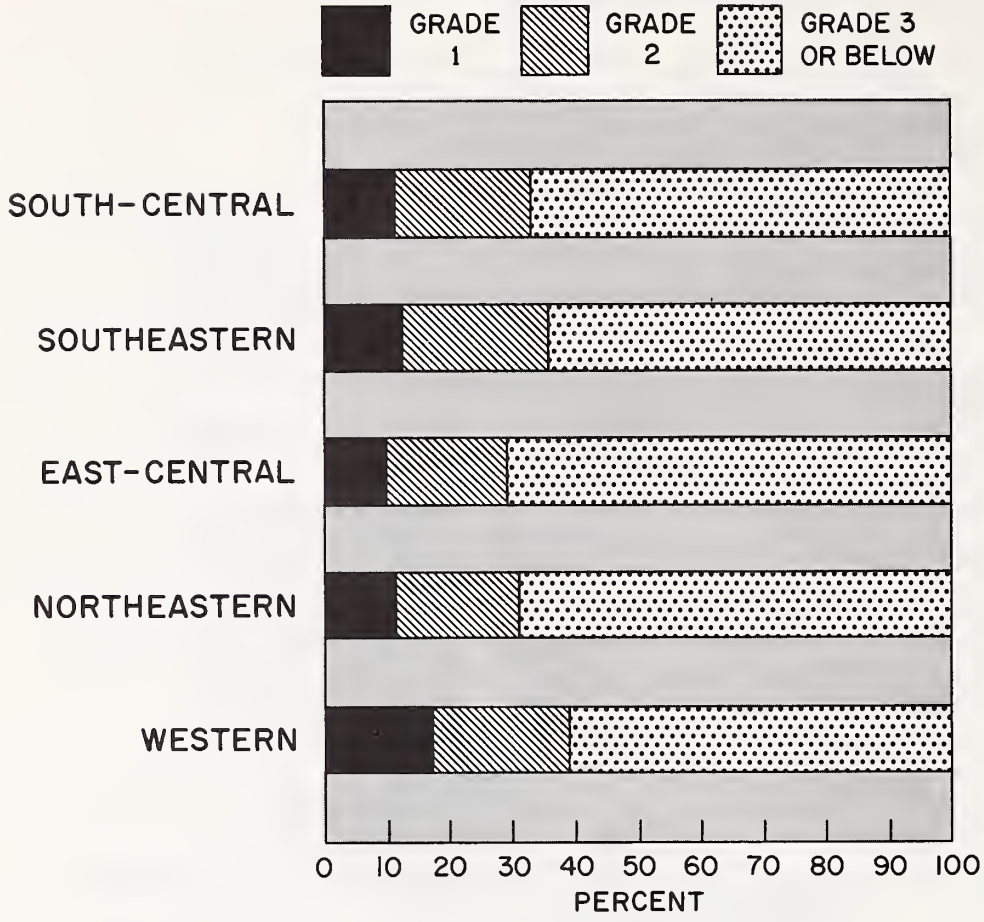
Figure 1.—The forest types and geographic regions in Ohio.



Ohio are concentrated (fig. 1). Although these three Hill Country regions accounted for only a third of the State's total land area in 1968, they accounted for 70 percent of the forestland acreage. Sixty-two million cubic feet of growing-stock volume, which includes 210 million board feet of sawtimber volume, was added annually to Hill Country stands during the 16-year base period. Only 50 percent of the board-foot volume, however, were in trees more than 15 inches in diameter at breast height. In contrast, 64 percent of the sawtimber volume and 44 percent of the cubic-foot volume in the Glaciated Western and Northeastern Regions were in trees whose dbh exceeded 15 inches. This explains in part why annual removals have exceeded net growth in the past; because the harvest was concentrated in the larger sawtimber stands.

Although the small trees contained in the Hill Country stands show promise of providing ample raw material for local sawmills and veneer plants in the future, at present the sawlogs that would result from harvesting the

Figure 2.—The hardwood sawtimber volume in Ohio in 1968, by standard-lumber log-quality grades and regions.



immature trees would be mostly of poor quality. Shown graphically (fig. 2), the distribution of hardwood volume by standard-lumber log grades confirms that this was the case, not only in the Hill Country, but in the Glaciated Regions as well. A major portion of the grade 3 and lower logs in all regions of the State are in small diameter sawtimber trees.

In addition to the quality limitations that hardwood tree size imposed on Ohio growing stock in 1968, the resource report showed that one out of every four tree stems on commercial forest land were cull. These trees were found to be either too rough or rotten to be classed as growing stock. Though much of the material in these trees could be used by certain industries for wood fiber, it presents a hindrance to quality tree development.

TIMBER-BASED INDUSTRIES

Then

When the first settlers arrived in Ohio in the 1780s nearly 95 percent of the land area was covered with mature hardwood forests. Most widespread was the beech-maple type, which covered the northern and western portions of the State. Oak and hickory dominated in the southeastern Allegheny foothills; and elm, ash, and soft maple were found in the poorly drained places.

Most of the settlers were farmers, so they proceeded to clear the forests for cropland. The best trees were usually cut for log buildings, fuel, roof shakes, stockade timbers, and fence rails because they were straight-grained

and easy to split. A cooperage industry developed, because barrels were the best means of transporting such items as whisky, gunpowder, flour, and salt. Great quantities of prime oak were felled just for the bark, and a tanbark industry was flourishing. Much of the timber was simply piled and burned.

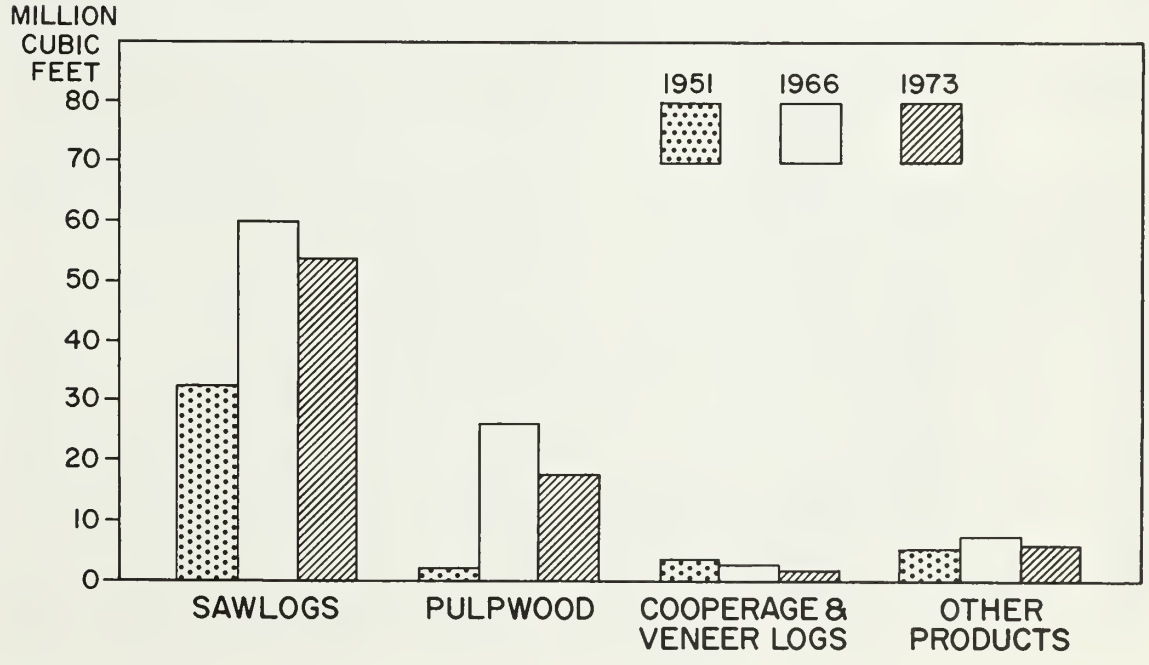
Settlement proceeded from the Ohio River, through the southern and southeastern foothills, to the more productive land to the north. About 1830 an iron industry developed in southern Ohio. Furnaces in the Hanging Rock Iron Region smelted with charcoal that was made from the surrounding forest. There is evidence that some tracts of timber close to the furnaces were cut over twice by the end of the Civil War, when the industry in southern Ohio waned.

The first sawmills in Ohio were water-powered. But since Ohio streams frequently flood, and water levels fluctuate widely, few good waterpower sites were available. By 1850, however, the introduction of the steam engine and extension of the eastern railroads into Ohio marked the beginning of a new era of development for Ohio's timber industries. Sawmills no longer depended on water power, and many steam-powered mills were established. Large quantities of forest products were needed locally for building the railroads, and for home, factory, and farm construction. In addition, the newly constructed railroads provided access to eastern markets for Ohio's wood products. During this period a number of secondary industries were established to produce furniture and agricultural implements. Ohio's coal industry, which began to expand rapidly around 1870, was a large consumer of wood for mine props and timbers.

By 1900, the lumber industry hit its zenith in Ohio. Nearly a billion board feet of lumber was being produced annually. But most of the forests had been cut over or cleared. Only about 15 percent of the land was in timber cover at the beginning of the twentieth century.

During the last half century, lumber production dropped rapidly. By 1942, an estimated 1,600 sawmills produced only 270 million board feet of lumber. Although lumber production has been maintained at this level, the number of mills that produce lumber in the State has decreased.

Figure 3.—Trend in industrial roundwood harvest in Ohio for selected years.



Now

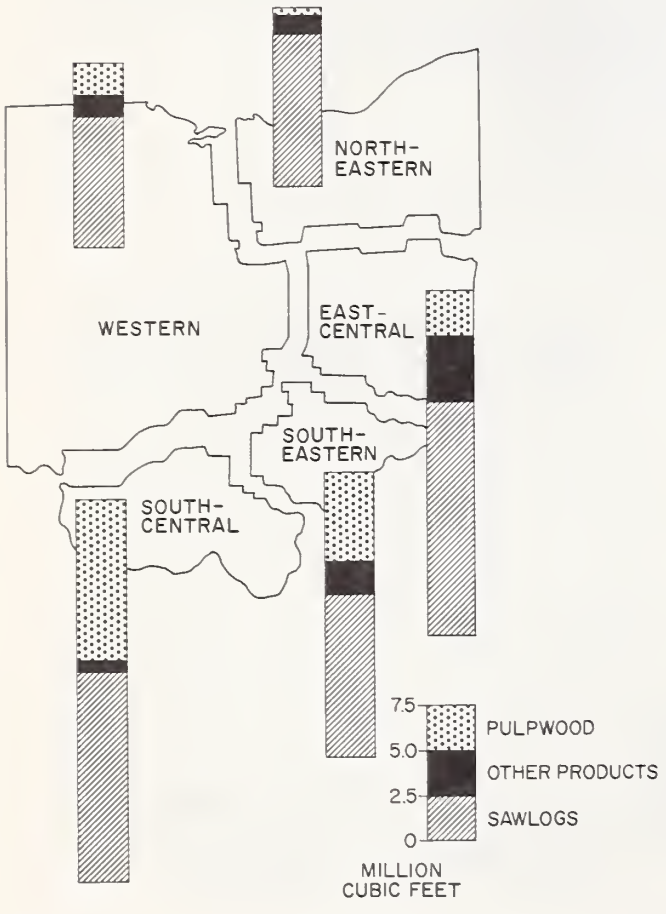
Industrial roundwood includes sawlogs, veneer logs, pulpwood, cooperage logs, mine timbers, posts, piling, and metallurgical wood. Nearly 80 million cubic feet of industrial roundwood was harvested from Ohio timberlands in 1973. Ninety-nine percent of this volume was from hardwoods.

Sawlogs were the major roundwood product, accounting for 68 percent of the Ohio timber harvest in 1973. Pulpwood ranked second in importance and accounted for 22 percent of the total volume harvested. All other products made up the remaining 10 percent.

Although the roundwood harvest has decreased in the past 7 years it has increased over the longer term (fig. 3). The harvest dropped 18 percent, from 97 million cubic feet in 1966 to 79 million cubic feet in 1973. The 1973 harvest, however, represented an 80 percent increase over that of 1951, when 44 million cubic feet were produced. Sawlogs and pulpwood led the increase, climbing 65 percent and 788 percent respectively, since 1951. Cooperage and veneer logs have maintained a continuing downtrend, while the production of other products have fluctuated with cyclical increases and decreases in market demand.

In 1973, the South-Central region of Ohio had the largest industrial timber harvest (22 million cubic feet) followed by the East-Central Region (21 million cubic feet) and the Southeastern Region (15 million cubic feet). Together these three Hill Country regions accounted for 73 percent of the total timber harvest. The East-Central Region was Ohio's largest sawlog-producing region in 1973, and the South-Central Region produced the largest volume of pulpwood (fig. 4).

Figure 4.—Harvest of industrial wood in Ohio, by regions and major products, 1973.



Tomorrow

Although the physical supply of timber seems to be adequate, the character of the developing timber stands and their availability for timber-product production are continually changing. Ohio's timber industries should strive to be flexible and should be willing to modify their wood requirements to conform more closely to the types of wood fiber that will be available. A primary goal for industry should be to provide for the complete and highest use of the State's timber resources; both now and in the future. More wood fiber from each forested acre should be recovered and channeled to the wood-using industry that is best suited to convert each class of roundwood into products.

Ohio industry is already keenly aware of the need for product segregation. Much of the industrial roundwood harvest is currently being diverted into such high-value products as face veneers, bourbon barrels, and furniture stock. To produce these products, however, hardwood logs are often channeled through several brokers and in the process are transported for hundreds of miles before final manufacture.

Ohio is fortunate to have resident representatives of a diversity of wood-using indus-

tries. This abundance of alternative market outlets for a variety of timber products enhances the prospects for complete utilization. In addition, southeastern Ohio timber is considered part of the total timber resources of the central Appalachian timbershed, which occupies parts of Kentucky, Virginia, and West Virginia. A portion of Ohio's timber resources will no doubt be allocated for use by high-volume multi-state enterprises in the future. Regardless of the industrial structure, the challenge remains the same; providing for the efficient harvesting, segregation, transporting, and manufacturing of the greatest amount of the total available wood fiber from each acre.

New technology, such as the total-tree harvesting systems that are being introduced into Ohio timber stands, will play an important role. This new harvesting concept has made it profitable to operate in stands that were previously being passed over when conventional logging systems were used. The total-tree system is ideally suited for converting hardwood stands to even-aged management and for forest land-clearing projects.

A companion harvesting system must still be developed for use in selectively harvested stands or for commercial thinnings in young growth stands. Conventional harvesting methods in most cases have proved to be too expensive unless an overstory of high-value trees is present.

Hardwood lumber will probably continue to be Ohio's most important timber product. The introduction of such industries as fiberboard and particleboard manufacture could stimulate greater wood recovery. Recent technological advances in these industries have caused their raw-material requirements to become less stringent. Increases in wood recovery could be achieved at both the harvesting and manufacturing levels.

Prospects are high for the increased demand for Ohio timber products by the coal-mining and rail-transportation industries. Heavy industry and public utilities are committed to decreasing their dependence on petroleum through increased use of coal. As more underground coal is extracted from Ohio coal mines, greater quantities of wood will be required for shoring, bracing, and other miscellaneous support materials.

Local tie-treating plants that are responding to plans for revitalizing and upgrading the long-neglected eastern and midwestern rail system have not been able until recently to attract the volume of ties that are required. As demand for hardwood lumber and pallet stock slackens, more lumber producers are switching to crosstie production. The federally-funded rail program, which is gaining momentum, promises to stimulate the demand for hardwood crossties for many years to come.

MAJOR TIMBER INDUSTRIES

Lumber and Sawlogs

Lumber production in Ohio has ranged from a high of nearly 1 billion board feet in 1899 to a low of 100 million board feet during the depression years of 1932-33. Much of the heavy cutting took place when the high-quality hardwood forests were being cleared for agriculture. As depletion of the original forests progressed, lumber production gradually declined. It leveled off at between 200 million and 250 million board feet annually, a figure that has been maintained for the past 25 years.

While lumber production has remained about the same, the number of sawmills producing the lumber has decreased. In 1942, the 1,600 sawmills that were operating in the State produced 270 million board feet of lumber. By 1966 the total number of sawmills operating in Ohio had dropped to 411. These mills produced 218 million board feet of lumber.

Our survey shows that 310 sawmills were operable in Ohio in 1973. Eighty-six of these sawmills processed more than a million board feet of sawlogs, and 122 processed less than a million board feet. One hundred and two sawmills were either idle in 1973 or were custom sawmills that produced wood products only for their own use. Between 1966 and 1973 average annual sawlog receipts at Ohio's sawmills have risen from 953 thousand board feet to 1.2 million board feet. Average sawlog receipts of the commercial sawmills in Ohio's Hill Country were 2.2 million board feet in 1973 while the average receipts of sawmills in the Glaciated Region were only 1.2 million board feet.

The species mix of Ohio's sawlog harvest reflects the species mix of the sawtimber resource over the years. The following tabulation illustrates how important the oaks have been over the years in relation to the total harvest:

Species	*1952 (percent)*	*1966 (percent)*	*1973 (percent)*
Oaks	45	43	47
Maples	16	14	12
Elms	12	4	2
Beech	8	5	7
Yellow-poplar	6	11	10
All other species	13	23	22

The percentage of the total sawlog harvest accounted for by such species as elm and hard maple has declined, while other species such as soft maple, ash, hickory, and cottonwood are growing in popularity.

Between 1966 and 1973, sawlog production in Ohio decreased 10 percent to 351 million board feet, and sawlog receipts at Ohio sawmills decreased 8 percent to 358 million board feet. Sawlog production in two of the Hill Country regions—South-Central and East-Central—were up 6 percent and 2 percent respectively. The State's Western Region experienced the largest percentage decline in production, from 81 million board feet in 1966 to 50 million board feet in 1973. Also, sawlog receipts in the Western Region dropped 37 percent during the period.

More than 700,000 board feet of softwood sawlogs were harvested from Ohio timberlands in 1973. Ninety percent of this volume was harvested and processed within the same geographic region. The other 10 percent was transported to other regions of the State for manufacture.

Eighty-four percent of the 350 million board-foot hardwood sawlog harvest in 1973 was produced in the region of manufacture. Another 15 percent was transported to other Ohio regions for manufacture, and nearly 800 thousand board feet of sawlogs were shipped to other states for manufacture.

Statewide, Ohio was a net importer of sawlogs in 1973. Some 200 thousand board feet of softwood logs and 8 million board feet of hardwood sawlogs were imported from other states by Ohio sawmill owners, while only 800 thousand board feet were exported to neighboring states.

Pulpwood

Papermaking is one of Ohio's oldest industries, but the manufacture of woodpulp has become important to the State only in the past two decades. The installed daily capacity of Ohio pulpmills has grown from 635 tons in 1959 to 1,820 tons in 1973. All this growth in capacity has been achieved through expansion of existing facilities rather than construction of pulpmills in new locations.

Pulpwood production in Ohio has grown in response to the increase in local pulpmill requirements. Total production has risen from less than 100 thousand cords annually in the early 1950s to 369 thousand cords in 1973. Nearly 98 percent of the Ohio production in 1973 was consumed by the State's six pulpmills. In addition, 157 thousand cords of pulpwood was imported from eight other states.

Pulp chips, recovered from sawmill and other primary manufacturing residues, have become an important source of wood for Ohio pulpmills. As late as 1961, records show, only 3 thousand cord equivalents of pulp chips were being recovered. By 1973, however, more than 146 thousand cord equivalents were produced by Ohio primary wood manufacturers.

A major reason for this increase in use of manufacturing residues is related to the changing character of the sawmill industry. A typical sawmill in Ohio in 1950 was a low-production, portable, circular mill operating on an isolated woodlot. These sawmills have been replaced now by high-production stationary mills that are located close to major transportation routes and are capable of producing a large and continuous volume of pulp chips.

The supply of pulp chips from manufacturing residues is limited by the volume of roundwood processed by industry. Our survey of Ohio manufacturers in 1973 showed that 94 percent of the coarse residues that are suitable for pulp chips are already being used. This high level of recovery indicates that this source of wood fiber is being fully exploited.

A new technological development that will probably affect pulpwood production in the future is total-tree harvesting. The system is especially well suited for hardwood stands such as those found in Ohio.

The heart of the harvesting system is a

mobile chipper that operates at the harvesting site. Most important, the system improves wood fiber per-acre yields because the branchwood, topwood, bark, and leaves are recovered with the stemwood. In addition, fiber is recovered from trees that in the past have been considered too small or rough to utilize because such trees now are chipped at the harvest site and transported to the pulpmill in van-type trailers. At least two Ohio pulpmills reported receiving total tree chips in 1973. One pulpmill was able to procure about a third of its wood requirement from this source.

WOODEN-CONTAINER INDUSTRIES

When Ohio was first settled, every large village had one or more cooperage shops, and veneer box and basket plants were commonplace in the agricultural areas. Because wooden containers such as baskets, boxes, and barrels are no longer important for transporting agricultural and other bulk products, the volume of wood used by these two Ohio industries has been declining.

Cooperage

The trade differentiates between wooden barrels constructed to hold liquids (tight cooperage) and those that hold dry materials (slack cooperage). Over the years, slack cooperage production in Ohio has dwindled to zero, because other packaging products such as fiber boxes and paper, cotton, and plastic bags have proved superior. Tight cooperage now depends entirely on the fabrication of bourbon barrels from white oak staves.

In 1962, the tight cooperage industry curtailed barrel production in anticipation of a new federal regulation that would allow the industry to re-use bourbon barrels. National barrel production dropped from 2.5 million barrels in 1961 to 2.0 million barrels in 1962. Production trended upward until 1968, when the regulation finally was put in force. Since then the national production level has dropped each year. National barrel production was 1.5 million in 1973.

Receipts of white oak cooperage logs at Ohio stave and heading mills mirrored the decline in demand for new barrels. The number of stave mills that operated dropped from 12 in 1964 to 7 in 1973. Cooperage-log receipts dropped from 17.3 million board feet to 8.2 million board feet during the period. Over three-fourths of the 1973 receipts came from Ohio forests.

Veneer

Ohio veneer logs are used either for the manufacture of container veneer and baskets or for face veneer for the furniture industry. The container-veneer industry can no longer compete with such substitute materials as plastics and corrugated paper in container construction, so many Ohio veneer plants are discontinuing operations. In 1960, 10 of 14 veneer plants in Ohio produced container veneer. In 1973, only four container veneer plants were operating. These plants accounted for less than a third of the volume of veneer logs received by Ohio veneer manufacturers.

High-quality hardwood logs that are suitable for face veneer are valuable, and many logs are shipped long distances for manufacture. In 1973, Ohio face-veneer manufacturers reported receiving logs from 10 states other than Ohio. Nearly half of the 5.9 million board feet of veneer logs that were harvested in Ohio were shipped to five other states and Canada for manufacture.

MINOR TIMBER INDUSTRIES

Ohio has several small stable wood-using industries whose combined wood requirements represented less than 10 percent of the harvest in 1973. Although some of these industries have exacting wood requirements as to species, size, and straightness of the wood they use, others are very flexible and can even use the residues from other wood-using plants.

The handle industry prefers hickory and ash, but also uses small amounts of red oak and hard maple. The logs and bolts must be straight and knot-free to be acceptable for shovel, hoe, pitchfork, and ax handles. The wood requirements of Ohio handle plants and

the harvest for this purpose has varied little in the past decade:

Year	Operating plants (number)	Production (million bd. ft.)	Receipts (million bd. ft.)
1962	5	2.7	3.1
1966	5	5.0	5.2
1973	3	4.6	4.0

In 1973, more than 89 percent of the wood receipts at Ohio handle mills was ash. Ash is used in the handles of such lifting and pulling tools as shovels and rakes.

Underground coal mining, which is concentrated in the East-Central region of Ohio, has depended upon local forests over the years as a source of mine props and shoring material. Some 1.4 million cubic feet of Ohio wood was used during 1973 in underground coal mines as round and split mine timbers. This figure represents an increase of 39 percent over 1966, when smaller tonnages of coal were being mined annually.

Ohio's charcoal industry has been expanding over the last two decades in response to increased use of charcoal briquettes for outdoor cooking. Since low-quality hardwoods and plant residues can be used for charcoal, the industry has a wide range of alternative wood suppliers. Over the years, as the price of roundwood has increased, more manufacturing residues have been consumed in charcoal production. Comparisons for selected years can be made with the following statistics:

Year	Roundwood consumed (thousand cords)	Residues consumed (thousand cords)
1956	0.2	13.2
1961	0.7	13.8
1966	0	12.0
1973	0	11.3

Electrometallurgical wood is used as a reductant, along with coke and coal, in smelting processes by which metals are extracted from their ores. Although the wood provides carbon for the chemical reaction, its primary usefulness is to provide bulk to the mix and maintain a porous charge that facilitates venting of the gases that are formed during the process.

There are two major sources of metallurgical chips, either roundwood or manufacturing residues. Many ferro-alloy plant managers prefer the roundwood chips because they contain more moisture. They say that the moist chips work deeper into the furnace before dissipating. Other managers, however, prefer the drier chips from manufacturing residues because they weigh less and are cheaper to transport.

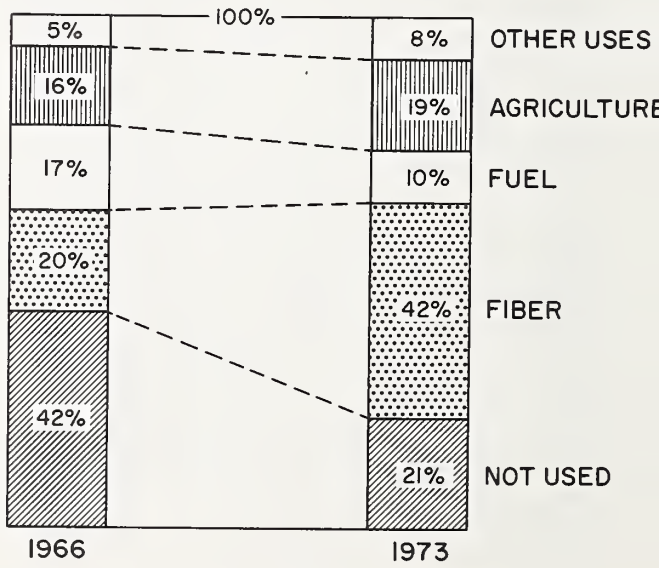
Seven ferro-alloy plants reported using more than 86,000 tons of metallurgical chips from Ohio roundwood and 90,000 tons of residues from Ohio wood-manufacturing plants in 1973. Most of these chips—95 percent of the roundwood and 97 percent of the residues—were from hardwoods.

MANUFACTURING RESIDUES

More than 34 million cubic feet of residues were generated by primary wood manufacturers in Ohio in 1973. More than 27 million cubic feet of this total was woody material, and nearly 7 million cubic feet was bark. More than 17 million cubic feet of the wood-residue material was suitable for conversion into wood chips for fiber products.

Seventy-three percent of all residues—25 million cubic feet—were recovered and used.

Figure 5.—Trends in manufacturing residue use in Ohio, 1966 and 1972. Comparison includes woody material only.



While only 46 percent of the bark residue was used, 79 percent of the wood residue was used. Heavy demand was experienced in 1973 for coarse residues such as sawmill slabs and edgings. Ninety-four percent of the total available was recovered and was used for such products as woodpulp, charcoal, and metallurgical wood.

When the results of our 1973 study in Ohio were compared to a similar study that was made in 1966, some important trends were identified (fig. 5):

- 21 percent more of the manufacturing residue volume generated in 1973 was being used than in 1966.
- 22 percent more of the manufacturing residue volume generated in 1973 was being used for fiber-product chips than in 1966.
- The use of manufacturing residues for agricultural purposes and for products such as charcoal and metallurgical wood is up for the period.

REFERENCES

American Forest Products Industries.
1961. OHIO FOREST FACTS. 15 p., illus. Ohio For. Ind. Comm., McArthur, Ohio.

Bones, James T., and David R. Dickson.
1969. PRIMARY WOOD PRODUCTS OUTPUT IN OHIO—1966. USDA For. Serv. Resour. Bull. NE-18. 19 p., illus. Northeast. For. Exp. Stn., Upper Darby, Pa.

Bones, James T., and David R. Dickson.
1970. THE VENEER INDUSTRY IN THE NORTHEAST. USDA For. Serv. Resour. Bull. NE-21. 17 p., illus. Northeast. For. Exp. Stn., Upper Darby, Pa.

Bones, James T., and David R. Dickson.
1974. THE VENEER INDUSTRY IN THE NORTHEAST—1972. USDA For. Serv. Resour. Bull. NE-33. 13 p., illus. Northeast. For. Exp. Stn., Upper Darby, Pa.

DeBald, Paul S., and Roger E. McCay.
1969. THE TIMBER RESOURCES OF THE OHIO HILL COUNTRY. USDA For. Serv. Resour. Bull. NE-14. 75 p., illus. Northeast. For. Exp. Stn., Upper Darby, Pa.

Gansner, David A.
1963. 1961 CHARCOAL PRODUCTION IN THE CENTRAL STATES. USDA For. Serv. Res. Note CS-1. 4 p. Cent. States For. Exp. Stn., Columbus, Ohio.

Gansner, David A.
1964. COOPERAGE LOGS AND BOLTS—PRODUCTION AND CONSUMPTION IN THE CENTRAL STATES—1962. USDA For. Serv. Res. Note CS-22. 4 p. Cent. States For. Exp. Stn., Columbus, Ohio.

Gansner, David A.
1965. CONSUMPTION OF COOPERAGE LOGS IN THE CENTRAL STATES—1964. USDA For. Serv. Res. Note CS-39. 4 p. Cent. States For. Exp. Stn., Columbus, Ohio.

Gansner, David A.
1965. HANDLE LOG CONSUMPTION IN THE CENTRAL STATES—1962. USDA For. Serv. Res. Note CS-33 4 p., Cent. States Forest Exp. Stn., Columbus, Ohio.

Hutchison, O. Keith, and James T. Morgan.
1956. OHIO'S FORESTS AND WOOD-USING INDUSTRIES. USDA For. Serv. For. Surv. Release 19. 40 p., illus. Cent. States For. Exp. Stn., Columbus, Ohio.

Kingsley, Neal P., and Carl E. Mayer.
1970. THE TIMBER RESOURCES OF OHIO. USDA For. Serv. Resour. Bull. NE-19. 137 p., illus. Northeast. For. Exp. Stn., Upper Darby, Pa.

McCauley, Orris D., and James C. Whittaker.
1967. THE VALUE ADDED BY SAWMILLING IN THE APPALACHIAN HILL COUNTRY OF OHIO AND KENTUCKY. USDA For. Serv. Res. Note NE-67. 4 p. Northeast. For. Exp. Stn., Upper Darby, Pa.

Mendel, Joseph J.
1959. VENEER LOG PRODUCTION AND CONSUMPTION IN THE CENTRAL STATES—1958. USDA For. Serv. Cent. States For. Exp. Sta. Tech. Pap. 166. 5 p., illus. Columbus, Ohio.

Mendel, Joseph H.
1959. COOPERAGE LOG AND BOLTS—PRODUCTION AND CONSUMPTION IN THE CENTRAL STATES—1958. USDA For. Serv. Cent. States For. Exp. Stn. Note 140. 2 p. Columbus, Ohio.

Mendel, Joseph H.
1962. VENEER LOG PRODUCTION AND CONSUMPTION IN THE CENTRAL STATES—1960. USDA For. Serv. Cent. States For. Exp. Sta. Tech. Pap. 189. 7 p., illus. Columbus, Ohio.

Mendel, Joseph H.
1962. COOPERAGE LOGS AND BOLTS—PRODUCTION AND CONSUMPTION IN THE CENTRAL STATES—1960. USDA For. Serv. Cent. States For. Exp. Stn. Note 153. 2 p. Columbus, Ohio.

Mendel, Joseph H.
1962. TRENDS IN PULPWOOD PRODUCTION AND CONSUMPTION IN THE CENTRAL STATES. USDA For. Serv. Cent. States For. Exp. Stn. Tech. Pap. 188. 10 p., illus. Columbus, Ohio.

Meteer, J. W.
1951. WOOD WASTE IN OHIO. Ohio Agric. Exp. Stn. Res. Bull. 698. 29 p., illus. Ohio Agric. Exp. Stn., Wooster.

Ohio Agricultural Experiment Station.
1944. OHIO'S FOREST RESOURCES. Ohio Agric. Exp. Stn. For. Pub. 76. 109 p. Wooster.

Quigley, Kenneth L.
1955. OHIO'S TIMBER HARVEST REVEALED IN STUMPS. USDA For. Serv. Cent. States For. Surv. Release 18. 12 p., illus. Cent. States For. Exp. Sta., Columbus, Ohio.

Thornton, Philip L.
1957. VENEER LOG PRODUCTION AND CONSUMPTION IN THE CENTRAL STATES—1956. USDA For. Serv. Cent. States For. Exp. Stn., Stn. Note 112. 2 p. Columbus, Ohio.

Thornton, Philip L.
1957. 1956 CHARCOAL PRODUCTION IN THE CENTRAL STATES. USDA For. Serv. Cent. States For. Exp. Sta., Sta. Note 109, 2 p., Columbus, Ohio.

USDA Forest Service.
1964. VENEER LOG PRODUCTION AND RECEIPTS IN EASTERN UNITED STATES, BY STATES AND SPECIES, 1963. USDA For. Serv. Res. Note WO-6. 5 p. Washington, D.C.

USDA Forest Service.
1973. THE OUTLOOK FOR TIMBER IN THE UNITED STATES. USDA For. Serv. Res. Rep. 20. 367 p., illus. Washington, D.C.

Wartluft, Jeffrey L.
1971. THE USE AND MARKET FOR WOOD IN THE ELECTRO-METALLURICAL INDUSTRY. USDA For. Serv. Res. Pap. NE-191. 12 p., illus. Northeast. For. Exp. Stn., Upper Darby, Pa.

INDEX OF TABLES

Timber Resources

1. Growing-stock inventory, average annual growth, removals, and change, by geographic region and species group, Ohio, 1968.
2. Sawtimber inventory, average annual growth, removals, and change, by geographic region and species group, Ohio, 1968.

Industrial Roundwood

3. Volume of industrial roundwood by products harvested in Ohio in 1973.
4. Timber products output from roundwood by products, Ohio, 1966 and 1973.
5. Industrial roundwood harvest in Ohio by geographic region, species group, and product, 1973.

Sawlog Statistics

6. Number of sawmills in Ohio by geographic regions and annual production classes, 1966 and 1973.
7. Sawlog production and receipt relationships in Ohio by geographic region, 1966 and 1973.
8. Sawlog production for Ohio by geographic region, species group, and where received, 1973.
9. Sawlog receipts for Ohio by geographic region, species group, and where produced, 1973.
10. Sawlog production for the SOUTH-CENTRAL REGION, by species and location of manufacture, 1973.
11. Sawlog receipts for the SOUTH-CENTRAL REGION, by species and source of logs, 1973.
12. Sawlog production for the SOUTHEASTERN REGION, by species and location of manufacture, 1973.
13. Sawlog receipts for the SOUTHEASTERN REGION, by species and source of logs, 1973.
14. Sawlog production for the EAST-CENTRAL REGION, by species and location of manufacture, 1973.
15. Sawlog receipts for the EAST-CENTRAL REGION, by species and source of logs, 1973.
16. Sawlog production for the NORTHEASTERN REGION, by species and location of manufacture, 1973.
17. Sawlog receipts for the NORTHEASTERN REGION, by species and source of logs, 1973.
18. Sawlog production for the WESTERN REGION, by species and location of manufacture, 1973.
19. Sawlog receipts for the WESTERN REGION, by species and source of logs 1973.

Other Product Statistics

20. Pulpwood production in Ohio, by species group, 1954-1973.
21. Output of pulpwood from roundwood in Ohio by species group and geographic region, 1964-73.
22. Veneer log and bolt production in Ohio by species and state (province) where consumed, 1973.
23. Veneer log and bolt receipts in Ohio by species and state where harvested, 1973.
24. Veneer-log production and receipts in Ohio for selected years.
25. White oak cooperage-log and bolt production and receipts and number of operating plants in Ohio for selected years.
26. Production and disposition of manufacturing residues, by type of residues, type of uses, and source industry, Ohio, 1973.

Table 1.—Growing-stock inventory, average annual growth, removals and change, by geographic region and species group, Ohio, 1968

Species group and geographic region	Inventory volume[a]	Average annual net growth	Average annual removals	Average annual change	
		Million cubic feet			*Percent of inventory*
Softwoods:					
South-Central	54	2.3	1.6	+0.7	1.3
Southeastern	28	.8	.5	+ .3	1.1
East-Central	28	1.1	.6	+ .5	1.8
Northeastern	5	(b)	(b)	(b)	(b)
Western	1	(b)	(b)	(b)	(b)
All softwoods	116	4.2	2.7	+1.5	1.3
Hardwoods:					
South-Central	1,098	39.9	18.6	+21.3	1.9
Southeastern	822	25.0	9.5	+15.5	1.9
East-Central	857	34.7	10.9	+23.8	2.8
Northeastern	632	21.0	10.0	+11.0	1.7
Western	656	8.0	18.8	−10.8	1.6
All hardwoods	4,065	128.6	67.8	+60.8	1.5
All species	4,181	132.8	70.5	+62.3	1.5

[a] Includes growing-stock trees on commercial forest land only.
[b] Negligible.

Table 2.—Sawtimber inventory, average annual growth, removals, and change, by geographic region and species group, Ohio, 1968

Species group and geographic region	Inventory Volume[a]	Average annual net growth	Average annual removals	Average annual change	
		Million board feet[b]			*Percent of inventory*
Softwoods:					
South-Central	189	8.9	7.6	+1.3	0.7
Southeastern	80	2.6	2.4	+ .2	.3
East-Central	70	2.5	2.5	—	—
Northeastern	11	(c)	(c)	(c)	(c)
Western	—	(c)	(c)	(c)	(c)
All softwoods	350	14.0	12.5	+1.5	0.4
Hardwoods:					
South-Central	3,625	132.7	51.6	+ 81.1	2.2
Southeastern	2,873	87.1	32.2	+ 54.9	1.9
East-Central	2,963	107.1	34.9	+ 72.2	2.4
Northeastern	2,173	63.6	34.6	+ 29.0	1.3
Western	2,568	17.5	43.7	− 26.2	1.0
All hardwoods	14,202	408.0	197.0	+211.0	1.5
All species	14,552	422.0	209.5	+212.5	1.5

[a] Includes growing-stock trees on commercial forest land only.
[b] International ¼-inch rule.
[c] Negligible.

Table 3.—Volume of industrial roundwood by products harvested in Ohio in 1973

Product	Volume in standard units				Roundwood volume		
	Standard unit	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods
					Thousand cubic feet		
Sawlogs	M bd. ft.[a]	350,829	779	350,050	53,978	120	53,858
Pulpwood	Std. cords	222,792	4,748	218,044	17,823	380	17,443
Veneer logs	M bd. ft.[a]	5,866	—	5,866	786	—	786
Cooperage logs	M bd. ft.[a]	6,372	—	6,372	933	—	933
Mine timbers	M cu. ft.	1,402	96	1,306	1,402	96	1,306
Misc. products[b]	M cu. ft.	4,461	280	4,181	4,461	280	4,181
Total					79,383	876	78,507

[a] International ¼-inch rule.
[b] Includes posts, piling, handle stock, and metallurgical wood.

Table 4.—Timber products output from roundwood by products, Ohio, 1966 and 1973

Product	All species			Softwoods			Hardwoods		
	1966	1973	Change	1966	1973	Change	1966	1973	Change
	Million cu. ft.		*Percent*	*Million cu. ft.*		*Percent*	*Million cu. ft.*		*Percent*
Sawlogs	60.0	54.0	−10	0.5	0.1	−77	59.5	53.9	− 9
Veneer logs	1.0	.8	−24	—	—	—	1.0	.8	−24
Pulpwood	26.9	17.8	−34	.8	.4	−54	26.1	17.4	−33
Cooperage logs	1.7	.9	−45	—	—	—	1.7	.9	−45
Mine timbers	1.0	1.4	+39	.2	.1	−53	.8	1.3	+62
Mics. products[a]	6.0	4.5	−25	.2	.3	+77	5.8	4.2	−28
Total	96.6	79.4	−18	1.7	0.9	−49	94.9	78.5	−17

[a] Includes poles, posts, piling, handle stock, and metallurgical wood.

Table 5.—Industrial roundwood harvest[a] in Ohio by geographic region, species group, and product, 1973

[In thousands of cubic feet]

Geographic region and species group	Product			All products
	Sawlogs	Pulpwood	Other products[b]	
South-Central:				
Softwoods	2	334	50	386
Hardwoods	12,616	8,768	495	21,879
Total	12,618	9,102	545	22,265
Southeastern:				
Softwoods	19	31	105	155
Hardwoods	9,925	3,488	1,658	15,071
Total	9,944	3,519	1,763	15,226
East-Central:				
Softwoods	56	15	221	292
Hardwoods	14,129	3,153	3,248	20,530
Total	14,185	3,168	3,469	20,822
Northeastern:				
Softwoods	3	—	—	3
Hardwoods	9,464	402	754	10,620
Total	9,467	402	754	10,623
Western:				
Softwoods	40	—	—	40
Hardwoods	7,724	1,632	1,051	10,407
Total	7,764	1,632	1,051	10,447
All regions:				
Softwoods	120	380	376	876
Hardwoods	53,858	17,443	7,206	78,507
Total	53,978	17,823	7,582	79,383

[a] Does not include fuelwood or removals that are not manufactured into industrial products.

[b] Other products include cooperage and veneer logs, mine timbers, handle stock, posts and pilings, and metallurgical wood.

Table 6.—Number of sawmills in Ohio by geographic regions and annual production classes, 1966 and 1973

Geographic region	Production class[a]							
	Greater than 1 million board feet		Less than 1 million board feet		Idle and custom mills		Total	
	1966	1973	1966	1973	1966	1973	1966	1973
South-Central	9	18	31	18	19	21	59	57
Southeastern	7	18	16	8	21	9	44	35
East-Central	10	18	24	27	33	17	67	62
Northeastern	5	17	33	32	57	21	95	70
Western	8	15	42	37	96	34	146	86
All regions	39	86	146	122	226	102	411	310

[a] Based upon the volume of lumber produced during calendar years 1966 and 1973.

Table 7.—Sawlog production and receipt relationships in Ohio by geographic region, 1966 and 1973

Geographic region	Production			Receipts		
	1966	1973	Change	1966	1973	Change
	Million bd. ft.[a]	*Million bd. ft.*[a]	*Percent*	*Million bd. ft.*[a]	*Million bd. ft.*[a]	*Percent*
South-Central	77.7	82.0	+ 6	76.3	69.7	− 9
Southeastern	75.4	64.6	−14	77.9	77.1	− 1
East-Central	90.0	92.2	+ 2	90.0	92.6	+ 3
Northeastern	65.2	61.5	− 6	67.0	68.2	+ 2
Western	81.4	50.5	−38	80.3	50.7	−37
All regions	389.7	350.8	−10	391.5	358.3	− 8

[a] International ¼-inch rule.

Table 8.—Sawlog production for Ohio by geographic region, species group, and where received, 1973

[In millions of board feet, International ¼-inch rule]

Species group and geographic region	Where received			Total production
	Within region	Within state	In other states	
Softwoods:				
South-Central	(*)	(*)	—	(*)
Southeastern	0.1	—	—	0.1
East-Central	.4	(*)	—	.4
Northeastern	(*)	—	—	(*)
Western	.2	0.1	—	.3
Softwoods	0.7	0.1	—	0.8
Hardwoods:				
South-Central	65.7	16.2	0.1	82.0
Southeastern	53.7	10.7	.1	64.5
East-Central	78.7	13.1	—	91.8
Northeastern	55.2	6.3	(*)	61.5
Western	41.8	7.8	.6	50.2
All hardwoods	295.1	54.1	0.8	350.0
All species	295.8	54.2	0.8	350.8

* Less than 50,000 board feet.

Table 9.—Sawlog receipts for Ohio by geographic region, species group, and where produced, 1973

[In millions of board feet, International ¼-inch rule]

Species group and geographic group	Where produced			Total receipts
	Within region	Within state	In other states	
Softwoods:				
South-Central	(*)	—	—	(*)
Southeastern	0.1	0.1	—	0.2
East-Central	.4	—	—	.4
Northeastern	(*)	—	0.2	.2
Western	.2	—	(*)	.2
All softwoods	0.7	0.1	0.2	1.0
Hardwoods:				
South-Central	65.7	2.1	1.9	69.7
Southeastern	53.7	20.0	3.2	76.9
East-Central	78.7	13.5	—	92.2
Northeastern	55.2	11.9	1.0	68.1
Western	41.8	6.7	1.9	50.4
All hardwoods	295.1	54.2	8.0	357.3
All species	295.8	54.3	8.2	358.3

* Less than 50,000 board feet.

Table 10.—Sawlog production for the SOUTH-CENTRAL REGION, by species and location of manufacture, 1973

[In thousands of board feet, International ¼-inch rule]

Species	Location of manufacture			Total production
	Retained in the region	Shipped to other regions	Shipped out of state	
White and red pine	6	—	—	6
Yellow pine	—	5	—	5
Total softwoods	6	5	—	11
Ash	2,691	971	—	3,662
Aspen[a]	2,011	102	—	2,113
Basswood	266	297	—	563
Beech	3,063	423	—	3,486
Black cherry	107	492	—	599
Elm	534	83	—	617
Hickory	5,238	1,246	—	6,484
Hard maple	3,145	917	—	4,062
Soft maple	3,541	1,184	—	4,725
White oak	11,179	2,118	—	13,297
Chestnut oak	7,081	842	—	7,923
Red oak	9,547	1,695	—	11,242
Black oak	7,423	2,201	—	9,624
Other oaks	909	27	—	936
Sycamore	1,294	413	—	1,707
Black walnut	1,059	54	123	1,236
Yellow-poplar	6,125	2,851	14	8,990
Other hardwoods	474	260	—	734
Total hardwoods	65,687	16,176	137	82,000
All species	65,693	16,181	137	82,011

[a] Includes cottonwood.

Table 11.—Sawlog receipts for the SOUTH-CENTRAL REGION, by species and source of logs, 1973

[In thousands of board feet, International ¼-inch rule]

Species	Source of logs			Total receipts
	Harvested within the region	Harvested in other regions	Harvested in other states	
White and red pine	6	—	—	6
Total softwoods	6	—	—	6
Ash	2,691	—	59	2,750
Aspen[a]	2,011	—	3	2,014
Basswood	266	—	16	282
Beech	3,063	240	66	3,369
Black cherry	107	—	12	119
Elm	534	—	3	537
Hickory	5,238	240	75	5,553
Hard maple	3,145	192	74	3,411
Soft maple	3,541	48	74	3,663
White oak	11,179	37	171	11,387
Chestnut oak	7,081	287	251	7,619
Red oak	9,547	212	622	10,381
Black oak	7,423	336	134	7,893
Other oaks	909	—	118	1,027
Sycamore	1,294	—	38	1,332
Black walnut	1,059	—	11	1,070
Yellow-poplar	6,125	480	172	6,777
Other hardwoods	474	—	—	474
Total hardwoods	65,687	2,072	1,899	69,658
All species	65,693	2,072	1,899	69,664

[a] Includes cottonwood.

Table 12.—Sawlog production for the SOUTHEASTERN REGION, by species and location of manufacture, 1973

[In thousands of board feet, International ¼-inch rule]

Species	Location of manufacture			Total production
	Retained in the region	Shipped to other regions	Shipped out of state	
Yellow pine	22	—	—	22
Other softwoods	100	—	—	100
Total softwoods	122	—	—	122
Ash	2,105	381	—	2,486
Aspen[a]	735	286	—	1,021
Basswood	795	5	—	800
Beech	3,422	897	—	4,319
Black cheery	1,108	213	—	1,321
Elm	795	2	—	797
Hickory	3,873	1,051	—	4,924
Hard maple	2,741	772	—	3,513
Soft maple	2,058	275	—	2,333
White oak	6,677	958	—	7,635
Chestnut oak	3,207	826	—	4,033
Red oak	8,638	1,632	—	10,270
Black oak	6,692	1,092	—	7,784
Other oaks	458	—	—	458
Sycamore	1,219	402	—	1,621
Black walnut	378	126	36	540
Yellow-poplar	7,998	1,621	—	9,619
Other hardwoods	840	192	—	1,032
Total hardwoods	53,739	10,731	36	64,506
All species	53,861	10,731	36	64,628

[a] Includes cottonwood.

Table 13.—Sawlog receipts for the SOUTHEASTERN REGION, by species and source of logs, 1973

[In thousands of board feet, International ¼-inch rule]

Species	Source of logs			Total receipts
	Harvested within the region	Harvested in other regions	Harvested in other states	
Yellow pine	22	5	—	27
Other softwoods	100	100	—	200
Total softwoods	122	105	—	227
Ash	2,105	945	76	3,126
Aspen[a]	735	377	—	1,112
Basswood	795	416	—	1,211
Beech	3,422	714	144	4,280
Black cherry	1,108	651	34	1,793
Elm	795	269	—	1,064
Hickory	3,873	1,431	213	5,517
Hard maple	2,741	989	164	3,894
Soft maple	2,058	1,328	61	3,447
White oak	6,677	1,912	480	9,069
Chestnut oak	3,207	1,242	274	4,723
Red oak	8,638	2,596	425	11,659
Black oak	6,692	2,113	685	9,490
Other oaks	458	55	69	582
Sycamore	1,219	601	—	1,820
Black walnut	378	148	76	602
Yellow-poplar	7,998	3,801	384	12,183
Other hardwoods	840	352	137	1,329
Total hardwoods	53,739	19,940	3,222	76,901
All species	53,861	20,045	3,222	77,128

[a] Includes cottonwood.

Table 14.—Sawlog production for the EAST-CENTRAL REGION, by species and location of manufacture, 1973

[In thousands of board feet, International ¼-inch rule]

Species	Location of manufacture			Total production
	Retained in the region	Shipped to other regions	Shipped to other states	
Hemlock	27	—	—	27
White and red pine	69	—	—	69
Other softwoods	247	20	—	267
Total softwoods	343	20	—	363
Ash	3,795	407	—	4,202
Aspen[a]	463	35	—	498
Basswood	387	56	—	443
Beech	6,250	1,252	—	7,502
Black cherry	2,450	164	—	2,614
Elm	2,062	581	—	2,643
Hickory	4,735	1,319	—	6,054
Hard maple	4,082	384	—	4,466
Soft maple	3,385	348	—	3,733
White oak	14,023	2,517	—	16,540
Chestnut oak	5,272	857	—	6,129
Red oak	10,100	2,082	—	12,182
Black oak	9,299	1,459	—	10,758
Other oaks	444	14	—	458
Sycamore	531	55	—	586
Black walnut	1,149	101	—	1,250
Yellow-poplar	9,007	1,423	—	10,430
Other hardwoods	1,285	62	—	1,347
Total hardwoods	78,719	13,116	—	91,835
All species	79,062	13,136	—	92,198

[a] Includes cottonwood.

Table 15.—Sawlog receipts for the EAST-CENTRAL REGION, by species and source of logs, 1973

[In thousands of board feet, International ¼-inch rule]

Species	Source of logs			Total receipts
	Harvested within the region	Harvested in other regions	Harvested in other states	
Hemlock	27	—	—	27
White and red pine	69	—	—	69
Other softwoods	247	—	—	247
Total softwoods	343	—	—	343
Ash	3,795	905	—	4,700
Aspen[a]	463	115	—	578
Basswood	387	5	—	392
Beech	6,250	1,204	—	7,454
Black cherry	2,450	335	—	2,785
Elm	2,062	160	—	2,222
Hickory	4,735	1,024	—	5,759
Hard maple	4,082	985	—	5,067
Soft maple	3,385	731	—	4,116
White oak	14,023	1,725	—	15,748
Chestnut oak	5,272	593	—	5,865
Red oak	10,100	2,311	—	12,411
Black oak	9,299	685	—	9,984
Other oaks	444	206	—	650
Sycamore	531	139	—	670
Black walnut	1,149	157	—	1,306
Yellow-poplar	9,077	2,063	—	11,070
Other hardwoods	1,285	195	—	1,480
Total hardwoods	78,719	13,538	—	92,257
All species	79,062	13,538	—	92,600

[a] Includes cottonwood.

Table 16.—Sawlog production for the NORTHEASTERN REGION, by species and location of manufacture, 1973

[In thousands of board feet, International ¼-inch rule]

Species	Location of manufacture			Total production
	Retained in the region	Shipped to other regions	Shipped to other states	
Hemlock	17	—	—	17
Other softwoods	4	—	—	4
Total softwoods	21	—	—	21
Ash	4,148	572	—	4,720
Aspen[a]	159	103	—	262
Basswood	1,757	—	—	1,757
Beech	4,953	791	—	5,744
Black cherry	2,200	92	—	2,292
Elm	2,901	148	—	3,049
Hickory	3,159	477	—	3,636
Hard maple	6,522	593	—	7,115
Soft maple	4,817	436	—	5,253
White oak	8,168	805	—	8,973
Chestnut oak	255	90	—	345
Red oak	8,245	921	—	9,166
Black oak	2,643	294	—	2,937
Other oaks	258	206	—	464
Sycamore	163	8	—	171
Black walnut	706	27	3	736
Yellow-poplar	2,961	775	—	3,736
Other hardwoods	1,151	3	—	1,154
Total hardwoods	55,166	6,341	3	61,510
All species	55,187	6,341	3	61,531

[a] Includes cottonwood.

Table 17.—Sawlog receipts for the NORTHEASTERN REGION, by species and source of logs, 1973

[In thousands of board feet, International ¼-inch rule]

Species	Source of logs			Total receipts
	Harvested within the region	Harvested in other regions	Harvested in other states	
Hemlock	17	—	124	141
Other softwoods	4	—	35	39
Total softwoods	21	—	159	180
Ash	4,148	741	82	4,971
Aspen[a]	159	108	—	267
Basswood	1,757	119	41	1,917
Beech	4,953	1,349	68	6,370
Black cherry	2,200	156	110	2,466
Elm	2,901	462	55	3,418
Hickory	3,159	1,055	41	4,255
Hard maple	6,522	921	123	7,566
Soft maple	4,817	639	55	5,511
White oak	8,168	2,297	145	10,610
Chestnut oak	255	233	—	488
Red oak	8,245	1,351	151	9,747
Black oak	2,643	1,179	27	3,849
Other oaks	258	—	14	272
Sycamore	163	99	—	262
Black walnut	706	60	7	773
Yellow-poplar	2,961	1,016	75	4,052
Other hardwoods	1,151	104	—	1,255
Total hardwoods	55,166	11,889	994	68,049
All species	55,187	11,889	1,153	68,229

[a] Includes cottonwood.

Table 18.—Sawlog production for the WESTERN REGION, by species and location of manufacture, 1973

[In thousands of board feet, International ¼-inch rule]

Species	Location of manufacture			Total production
	Retained in the region	Shipped to other regions	Shipped to other states	
Other softwoods	182	80	—	262
Total softwoods	182	80	—	262
Ash	2,994	726	38	3,758
Aspen[a]	2,424	348	—	2,772
Basswood	758	182	27	967
Beech	2,489	909	—	3,398
Black cherry	388	181	—	569
Elm	197	77	—	274
Hickory	2,788	383	—	3,171
Hard maple	3,567	1,059	27	4,653
Soft maple	1,830	684	14	2,528
White oak	10,134	645	30	10,809
Chestnut oak	494	165	—	659
Red oak	6,564	920	31	7,515
Black oak	2,383	222	7	2,612
Other oaks	896	41	—	937
Sycamore	1,490	245	—	1,735
Black walnut	775	57	398	1,230
Yellow-poplar	934	827	35	1,796
Other hardwoods	681	134	1	816
Total hardwoods	41,786	7,805	608	50,199
All species	41,968	7,885	608	50,461

[a] Includes cottonwood.

Table 19.—Sawlog receipts for the WESTERN REGION, by species and source of logs, 1973

[In thousands of board feet, International ¼-inch rule]

Species	Source of logs			Total receipts
	Harvested within the region	Harvested in other regions	Harvested in other states	
Other softwoods	182	—	27	209
Total softwoods	182	—	27	209
Ash	2,994	466	93	3,553
Aspen[a]	2,424	274	240	2,938
Basswood	758	—	10	768
Beech	2,489	765	103	3,357
Black cherry	388	—	—	388
Elm	197	—	—	197
Hickory	2,788	726	14	3,528
Hard maple	3,567	638	14	4,219
Soft maple	1,830	181	96	2,107
White oak	10,134	1,072	167	11,373
Chestnut oak	494	425	—	919
Red oak	6,564	780	833	8,177
Black oak	2,383	955	82	3,420
Other oaks	896	27	82	1,005
Sycamore	1,490	284	123	1,897
Black walnut	775	—	7	782
Yellow-poplar	934	137	76	1,147
Other hardwoods	681	—	—	681
Total hardwoods	41,786	6,730	1,940	50,456
All species	41,968	6,730	1,967	50,665

[a] Includes cottonwood.

Table 20.—Pulpwood production in Ohio, by species group, 1954-1973[a]

[In thousands of rough cords]

Year	All species	Softwoods	Hardwoods
1954	67.6	—	67.6
1955	79.8	—	79.8
1956	95.3	1.1	94.2
1957	116.8	.8	116.0
1958	140.5	.8	139.7
5-year total	500.0	2.7	497.3
1959	165.3	.8	164.5
1960	214.4	1.5	212.9
1961	246.3	.8	245.5
1962	269.0	.7	268.3
1963	299.6	1.8	297.8
5-year total	1,194.6	5.6	1,189.0
1964	332.3	8.7	323.6
1965	313.1	12.2	300.9
1966	375.5	10.4	365.1
1967	336.0	15.1	320.9
1968	266.1	5.7	260.4
5-year total	1,623.0	52.1	1,570.9
1969	299.4	12.2	287.2
1970	343.8	13.4	330.4
1971	360.1	11.3	348.8
1972	327.9	8.6	319.3
1973	369.4	9.1	360.3
5-year total	1,700.6	54.6	1,646.0

[a] Includes production from both roundwood and manufacturing-plant residues.

Table 21.—Output of pulpwood from roundwood in Ohio by species group and geographic region, 1964-73

[In thousands of rough cords]

Species group and geographic region	Roundwood pulpwood output in—										All years
	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	
Softwoods:											
South-central	4.8	6.8	7.3	9.7	4.3	8.9	8.9	6.6	4.8	4.2	66.3
Southeastern	3.8	5.2	2.7	4.2	0.9	2.4	4.3	3.1	.9	.4	27.9
East-central	—	—	—	—	.1	(*)	(*)	—	(*)	.2	.3
Northeastern	.1	.1	.1	.2	.1	.6	.2	—	.7	—	2.1
Western	—	—	.3	1.0	.3	.3	—	—	—	—	1.9
All regions	8.7	12.1	10.4	15.1	5.7	12.2	13.4	9.7	6.4	4.8	98.5
Hardwoods:											
South-central	103.1	133.5	142.6	142.2	125.4	136.1	128.4	115.7	115.1	109.6	1,251.7
Southeastern	49.9	48.6	62.6	55.2	49.4	27.9	55.2	59.2	56.3	43.6	507.9
East-central	56.3	45.4	82.1	31.4	29.4	33.3	26.7	56.1	26.3	39.4	426.4
Northeastern	14.1	7.3	6.0	6.1	5.4	6.6	8.0	10.7	9.5	5.0	78.7
Western	23.5	25.5	33.0	31.1	17.3	14.8	20.1	24.6	20.2	20.4	230.5
All regions	246.9	260.3	326.3	266.0	226.9	218.7	238.4	266.3	227.4	218.0	2,495.2
All species	255.6	272.4	336.7	281.1	232.6	230.9	251.8	276.0	233.8	222.8	2,593.7

(*) Less than 50 cords.
* Less than 50 cords.

Table 22.—Veneer log and bolt production in Ohio by species and state (province) where consumed, 1973[a]

[In thousands of board feet, International ¼-inch rule]

Species	State (province) where consumed							Total production
	Ohio	Illinois	Indiana	Kentucky	New York	Ontario	West Virginia	
Ash	2	1	36	4	—	—	—	43
Hickory	168	—	96	1	—	5	—	270
Maple	304	1	27	—	1	—	—	333
Oak, red	1	25	480	9	—	22	—	537
Oak, white	187	27	680	89	12	23	500	1,518
Walnut, black	875	49	487	63	—	62	—	1,536
Yellow-poplar	160	—	—	—	91	—	—	251
Other hardwoods[b]	1,323	4	46	—	5	—	—	1,378
All species	3,020	107	1,852	166	109	112	500	5,866

[a] Veneer logs that were handled by brokers for overseas shipment are not included.
[b] Includes beech, elm, basswood, black cherry, cottonwood, and sycamore.

Table 23.—Veneer-log and bolt receipts in Ohio by species and state where harvested, 1973

[In thousands of board feet, International ¼-inch rule]

Species	States where harvested								Total receipts
	Ohio	Illinois	Indiana	Iowa	Kentucky	Michigan	Tennessee	Other states[a]	
Beech	862	—	—	—	—	—	—	—	862
Hickory	168	—	—	—	—	—	—	312	480
Maple	304	—	218	—	—	455	—	—	977
Oaks	89	6	37	6	12	19	19	—	188
Sycamore	338	—	—	—	—	—	—	20	358
Walnut, black	875	250	500	250	250	—	250	250	2,625
Yellow-poplar	160	—	—	—	—	—	—	—	160
Other hardwoods[b]	224	—	—	—	—	—	—	—	224
All species	3,020	256	755	256	262	474	269	582	5,874

[a] Includes Missouri, Mississippi, Pennsylvania, and Texas.
[b] Includes ash, basswood, black cherry, cottonwood, and elm.

Table 24.—Veneer-log production and receipts in Ohio for selected years

[In thousands of board feet, International ¼-inch rule]

Year	Production[a]	Receipts
1956	8,731	5,658
1958	8,035	6,086
1960	11,135	6,739
1963	8,449	5,000
1966	6,712	5,648
1968	7,886	4,781
1972	7,200	6,914
1973	5,866	5,874

[a] Veneer logs that were handled by brokers for overseas shipment are not included.

Table 25.—White oak cooperage-log and bolt production and receipts and number of operating plants in Ohio for selected years

[In thousands of board feet, International ¼-inch rule]

Year	Number of plants	Production	Receipts
1958	4	8,579	8,600
1960	11	13,598	14,735
1962	10	12,427	12,654
1964	12	16,000	17,303
1966	7	11,000	12,838
1973	7	6,372	8,210

Table 26.—Production and disposition of manufacturing residues, by type of residues, type of uses, and source industry, Ohio, 1973

[In thousands of cubic feet]

Source industry	Type of use	Type of residue			All Types
		Bark	Coarse[a]	Fine[b]	
Lumber	Fiber	—	10,940	135	11,035
	Fuel[c]	776	2,136	176	3,088
	Agricultural[d]	1,526	—	4,944	6,470
	Other[e]	629	1,802	—	2,431
	All uses	2,931	14,878	5,255	23,064
	Unused	3,594	944	4,568	9,106
Cooperage	Fiber	—	319	—	319
	Fuel	49	85	24	158
	Agricultural	—	—	52	52
	Other	—	167	3	170
	All uses	49	571	79	699
	Unused	66	8	22	96
Veneer	Fiber	—	220	—	220
	Fuel	101	199	120	420
	Agricultural	—	—	94	94
	Other	—	102	—	102
	All uses	101	521	214	836
	Unused	5	16	11	32
Other industries[f]	Fiber	—	—	—	—
	Fuel	65	69	—	134
	Agricultural	—	—	39	39
	Other	—	256	—	256
	All uses	65	325	39	429
	Unused	8	45	34	87
All industries	Fiber	—	11,479	135	11,614
	Fuel	991	2,489	320	3,800
	Agricultural	1,526	—	5,129	6,655
	Other	629	2,327	3	2,959
	All uses	3,146	16,295	5,587	25,028
	Unused	3,673	1,013	4,635	9,321

[a] Coarse residues include slabs, edgings, trimmings, veneer cores, and other material suitable for chipping.

[b] Fine residues include sawdust, shavings, and other material considered unsuitable for chipping.

[c] Includes both domestic and industrial fuel.

[d] Includes livestock bedding and farm and horticultural mulch.

[e] Includes small dimension, charcoal wood, and metallurgical chips.

[f] Excludes the woodpulp industry.

Headquarters of the Northeastern Forest Experiment Station are in Upper Darby, Pa. Field laboratories and research units are maintained at:

- Amherst, Massachusetts, in cooperation with the University of Massachusetts.
- Beltsville, Maryland.
- Berea, Kentucky, in cooperation with Berea College.
- Burlington, Vermont, in cooperation with the University of Vermont.
- Delaware, Ohio.
- Durham, New Hampshire, in cooperation with the University of New Hampshire.
- Hamden, Connecticut, in cooperation with Yale University.
- Kingston, Pennsylvania.
- Morgantown, West Virginia, in cooperation with West Virginia University, Morgantown.
- Orono, Maine, in cooperation with the University of Maine, Orono.
- Parsons, West Virginia.
- Pennington, New Jersey.
- Princeton, West Virginia.
- Syracuse, New York, in cooperation with the State University of New York College of Environmental Sciences and Forestry at Syracuse University, Syracuse.
- Warren, Pennsylvania.

FOREST SERVICE
6816 MARKET STREET
UPPER DARBY, PENNA. 19082

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

LIBRARY RATE – EDUCATIONAL MATERIAL

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF
AGRICULTURE
AGR-101

U.S.MAIL

DATE DUE

10-2833			

DEMCO 38-297

SD11
A408
nos. 25-40

U.S. Forest Service. Northeastern
Forest Experiment Station.
RESOURCE BULLETINS.

DATE DUE	BORROWER'S NAME	ROOM

NATIONAL AGRICULTURAL LIBRARY
1022964895